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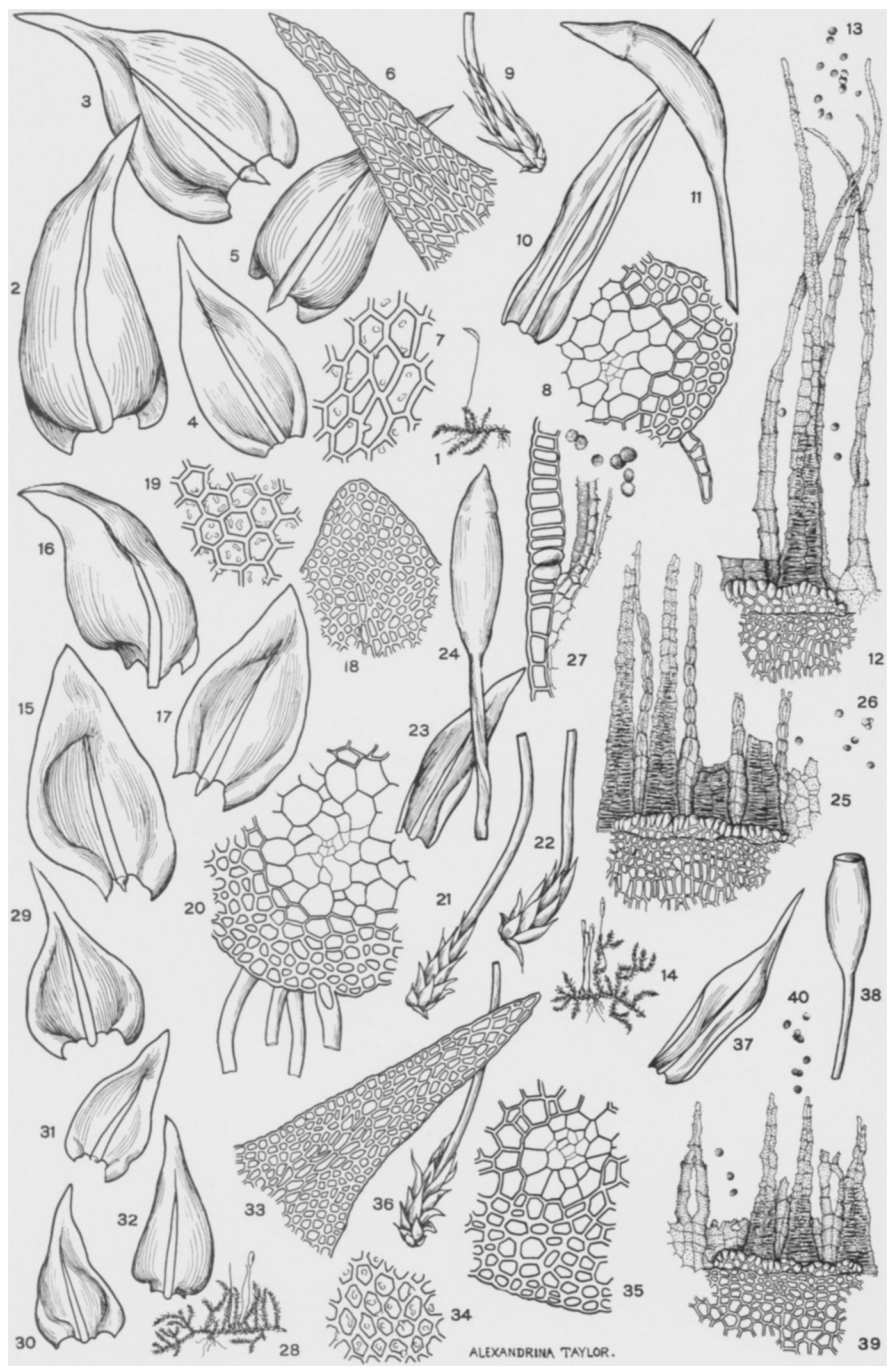
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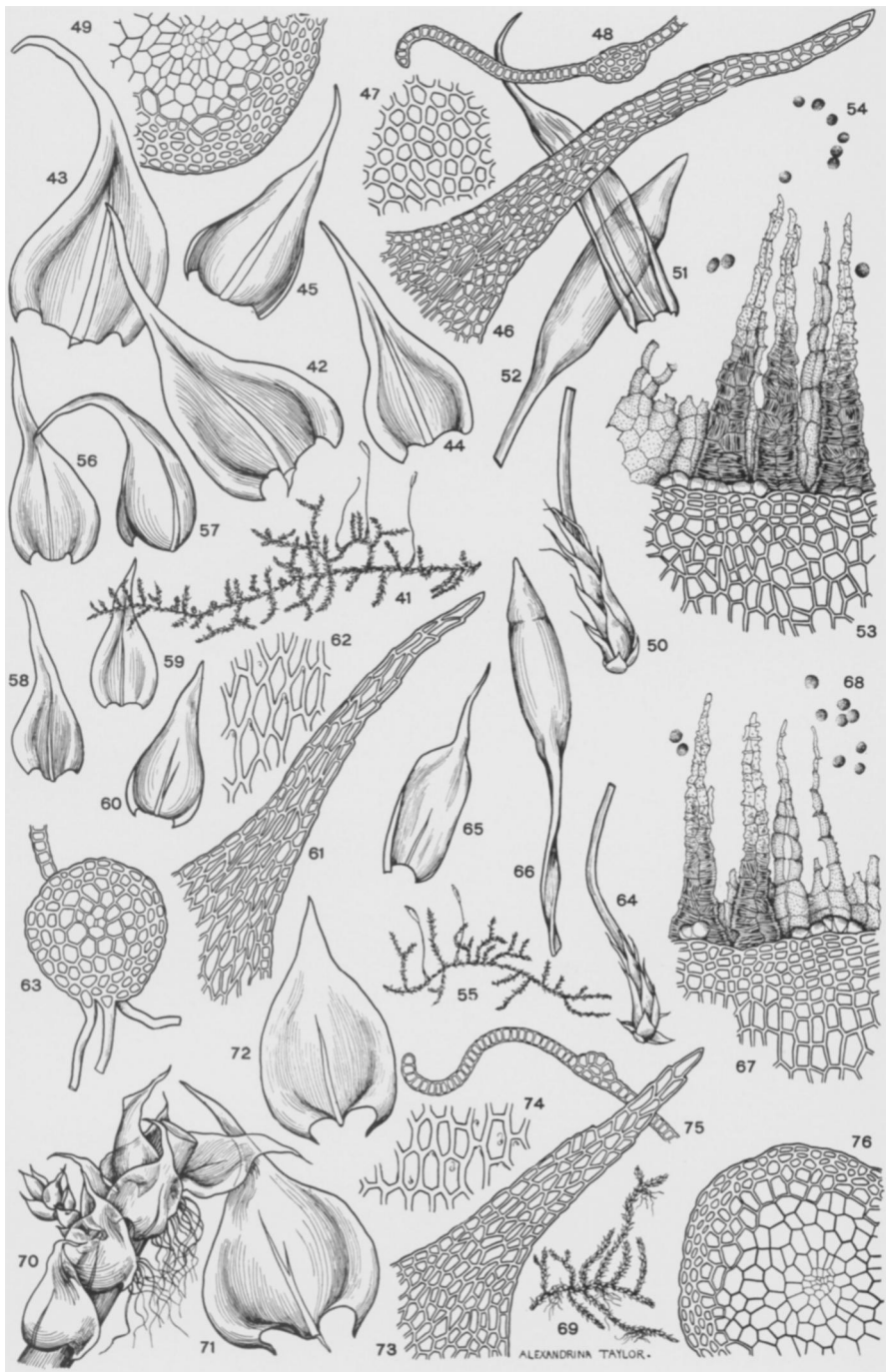


LESKEA

1-13. L. ARENICOLA.

14-27. L. OBSCURA.

28-40. L. MICROCARPA.



LESKEA

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BULLETIN  
OF THE  
TORREY BOTANICAL CLUB

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SEPTEMBER, 1903

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Revision of the North American Species of *Leskea*

BY G. N. BEST

(WITH PLATES 15 AND 16)

The larger part of the material upon which this revision is based was furnished by the New York Botanical Garden, the Geological Survey of Canada, the Department of Agriculture at Washington, the Academy of Natural Sciences of Philadelphia and Harvard University. The author wishes to acknowledge his indebtedness to these institutions and to beg those having them in charge to accept his sincere thanks. He also wishes to acknowledge his obligations to Prof. John Macoun for the loan of duplicates and cotypes of Kindberg's new species; to Mrs. Britton for assistance in procuring types, in furnishing citations and rare specimens and for unnumbered kindnesses; to Prof. J. M. Holzinger for the contribution of a large number of valuable specimens from an unexplored region; to M. Jules Cardot for specimens, notes and publications; and to Dr. A. J. Grout, Dr. J. K. Small, Mr. R. S. Williams, Mr. C. F. Baker, Prof. F. S. Earle, Mr. H. N. Dixon, Mrs. A. M. Smith, Miss Edith A. Warner, Mr. E. D. Merrill, Mr. A. Gepp, Mr. John Moser and Dr. W. A. Kellerman for many and varied contributions. His thanks are especially due Miss Alexandrina Taylor for the excellent drawings which accompany this revision and on which its value so largely depends.

*LESKEA* Hedw. Fund. 2: 93. 1782.

Plants small to medium-sized, growing in tufts about the base

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of trees, on rotten wood, more rarely on stones, rocks or the ground, in damp shady places. Stems prostrate, usually radiculose, sometimes paraphyllose, pinnately to fasciculately branched, rarely stoloniferous; central strand usually small, sometimes rudimentary or none; leaves not heteromorphous, often papillose, ovate to ovate-lanceolate, acute, acuminate or obtuse, usually unicostate, sometimes shortly bicostate, nearly or quite entire (excl. *L. denticulata*); leaf-cells somewhat uniform, median quadrate-hexagonal to oval-oblong, rarely elongated: pedicels smooth: capsules usually straight and erect, sometimes curved, oval to subcylindric, annulate; teeth well-developed, lanceolate-linear, divisural line and lamellae rarely absent; endostomial band narrow, about one fourth to one sixth the length of the teeth; segments linear, often keeled and cleft; cilia usually none or rudimentary; opercula mammillate to long conic, rarely rostellate; calyptrae cucullate, smooth.

*Leskea*, written *Leskia* by Hedwig and so named in honor of Professor Gottfried Leske of Leipzig, formerly contained a large number of species which in more recent times have been divided up and placed under other genera. *Leskea paludosa* (1793), usually regarded as a variety of *L. polycarpa* Ehrh., *L. gracilescens* (1801) and *L. obscura* (1801) are the only Hedwigian species now recognized as belonging to this genus. As *Leskea* was founded in 1782, neither of these species could have been the first to have been described under it, and if the claim is allowed that the first species described under a genus is the type of that genus, it follows that the name *Leskea* or *Leskia* must displace that of some other genus and unless otherwise provided for, a new name must be given the one under consideration. The usually accepted type of *Leskea* is *L. polycarpa*, and since both the name and the type have had the sanction of all recent authorities the author of this revision feels constrained likewise to accept them even at the risk of having his citations subsequently overturned by some one less conservative than himself.

#### Key to the Species.

EULESKEA: leaves papillose, costate; median cells usually isodiametric; peristomial teeth abruptly incurved from a bulging base when dry.

Leaves ovate-lanceolate, acute to acuminate, more than twice as long as wide.

Leaves more or less secund; leaf-cells distinct.

Capsules straight; operculum short-conic.

*L. polycarpa*.

Capsules curved; operculum long-conic.

*L. arenicola*.

Leaves straight; leaf-cells small, indistinct: capsules straight, erect.

*L. microcarpa*.

- Leaves ovate, subacute to obtuse, less than twice as long as wide.  
 Leaves symmetric, biplicate, margins often revolute. *L. gracilescens.*  
 Leaves asymmetric, not plicate, margins plane. *L. obscura.*  
 HETEROLESKEA: leaves smooth or nearly so, costate or ecostate, median cells longer than wide; peristomial teeth erect when dry.  
 Leaves denticulate, ecostate. *L. denticulata.*  
 Leaves entire or nearly so, costate;  
 Acumen longer than body;  
 Costa subpercurrent. *L. nervosa.*  
 Costa short. *L. Williamsi.*  
 Acumen shorter than body;  
 Costa short, bifid.  
 Leaves smooth. *L. tectorum.*  
 Leaves subpapillose. *L. cyrtophylla.*

1. LESKEA POLYCARPA Ehrh. Dec. Crypt. 96. 1788.

*Hypnum repens trichodes arboreum medium capitulis erectis* Dill.

Cat. Giss. 216. 1718.

*Hypnum trichodes, capsulis oblongis, in setis brevioribus* Dill.

Hist. Musc. 331. 1741.

*Hypnum medium* Dicks. Crypt. 2: 12. 1790.

*Hypnum polycarpon* Hoffm. Deutsch. Fl. 2: 67. 1796.

*Leskea paludosa* var. *polycarpa* Hartm. Skand. Fl. Ed. 5, 337. 1849.

In spreading tufts or loose mats, pale green, sometimes dirty dark green, passing to yellowish green or reddish brown; stems prostrate, 2–4 cm. long, radiculose, subpinnately branched; central strand small, distinct: paraphyllia few, linear-lanceolate: stem-leaves\* loosely appressed when dry, erect-spreading when moist, 0.8–1.2 mm. long, 0.35–0.45 mm. wide, from a subcordate, slightly decurrent, ovate or oblong-ovate base, lanceolate, gradually acute to abruptly acuminate, more or less secund and obliquely pointed, biplicate, entire, one or both basal margins usually recurved, costa disappearing below apex; branch-leaves smaller, often obtuse or blunt-pointed; median cells of stem-leaves roundish quadrate-hexagonal, 7–8  $\mu$  wide, with one or two small papillae on each surface; basal quadrate-oblong; alar quadrate or transversely oval: monoicous: perichetial bracts erect, oblong-lanceolate, acuminate, inner subvaginant, plicate-striate, lightly costate; pedicel about 1 cm. long, smooth; capsule erect, straight or

\* When stem-leaves are referred to those from the middle third of the stem are meant and when branch-leaves those from the middle third of a branch. In most species of this genus a considerable difference will be found between the upper and lower leaves. The plicae of the leaves are seen to the best advantage before pressure is applied.

slightly curved, subcylindric, tapering at base, greenish yellow changing to yellowish or reddish brown, wrinkled when dry and contracted below mouth; urn about 2 mm. long, 7 mm. wide; exothecial cells oblong-rectangular, thin-walled; teeth yellowish, linear-lanceolate, lamellate, dorsal line distinct; endostomial band about one fourth the length of the teeth; segments linear, nearly as long as teeth, scarcely open on the keel; cilia rudimentary or none; annulus of two rows of cells; operculum conic; calyptra cucullate; spores usually smooth, 9-12  $\mu$ , mature in early summer. On the base of trees, rotten wood, rarely on stones or the ground.

TYPE LOCALITY: Germany.

DISTRIBUTION: From Newfoundland westward through Canada to Montana and southward.

ILLUSTRATIONS: Husnot, *Musc. Gal. pl.* 85. Dixon & Jame-son, *Handbook, pl.* 50. Braithwaite, *Brit. Moss-Flora*, 3: *pl.* 86. Limpricht, *Die Laubmoose, f.* 343.

The typical European form of *L. polycarpa* is not so common in North America as is generally supposed, and when it does occur it is usually somewhat smaller. Between it and *L. obscura* a number of transitional forms are met with which differ from the former in having their leaves smaller, straighter and more obtuse. In fact these forms show the results of an influence which culminates in the production of *L. obscura*, a species unknown in Europe. As these intermediate forms are much more common than those of the types, it has been thought advantageous to cover them, at least in part, by admitting Hedwig's *L. gracilescens* which, if it has no other merit, has that of convenience.

## 2. *Leskea polycarpa subobtusifolia* (C. M. & K.).

*Leskea subobtusifolia* C. M. & K.; Macoun, *Cat. Can. Pl.* 6: 169. 1892.

Subsp. *L. obtusifolia* Kindb. *Eur. & N. Am. Bry.* 25. 1896.

Tufts dirty yellowish green; stems and branches curved at tips: stem-leaves subsecund, biplicate, ovate-oblong to ovate-lanceolate, subacute to obtuse, obliquely pointed, the lower acuminate and blunt-pointed, 1 mm. long, 0.4 mm. wide; leaf-cells as in *L. polycarpa*. Macoun, *Canadian Musci* 533.

Professor Macoun has kindly loaned me the duplicate of the type, collected at Sproat, Pass River, B. C., as well as other material from the same locality and referred to it. All the speci-

mens are destitute of fruit and are unquestionably but forms of *L. polycarpa*, nearer however the var. *paludosa* than the type. It is retained as a variety from the fact that the sporophyte when found might possibly offer something distinctive entitling it to specific rank.

3. *LESKEA POLYCARPA PALUDOSA* (Hedw.) Schimp. Syn. 486. 1860.

? *Hypnum palustre* Huds. Fl. Angl. 429. 1762.

*Leskea palustris* Hedw. Descr. 4: 1. pl. 1. 1793.

*Leskea paludosa* Hedw. Descr. 4: 115. 1797.

*Hypnum inundatum* Dicks. Crypt. 4: 17. 1801.

In dirty green, often blackish spreading tufts; stouter, more diffusely branched; stems and branches longer, somewhat curved at tips: stem-leaves usually secund, distant, ovate-lanceolate, acute to obtuse, sometimes obliquely acuminate, up to 1.4 mm. long and 0.5 mm. wide; median leaf-cells roundish quadrate, unipapillate on both surfaces; basal oblong-rectangular: capsule longer, often slightly bent or curved, reddish-brown with age. In wet places, sometimes submerged, about the base of trees and on rotten wood, rarely on stones.

With the type, but less frequent; more common in the northwest. North Dakota (Holzinger); Montana (Holzinger, Williams); Idaho (Röll); Oregon (Röll); British Columbia (Macoun).

European bryologists differ not a little in their treatment of *L. polycarpa* and var. *paludosa*. The stouter forms of the former are often assigned to the latter, in fact distinguishing characters are wanting. It is evident that the extremes are so closely connected by intergrading forms that it is impossible to say just where *L. polycarpa* ends and var. *paludosa* begins.

#### 4. *Leskea arenicola* sp. nov.

Plants somewhat rigid, in loosely spreading tufts, pale yellowish green passing to reddish brown; stems 2–5 cm. long, creeping, radiculose, pinnately branched; branches simple, ascending, sometimes curved; central strand small, distinct: paraphyllia multifiform, mostly linear-lanceolate: stem-leaves rigid, secund, 0.4–0.5 mm. wide, 0.8–1 mm. long, ovate to ovate-lanceolate, obliquely acuminate, acute to blunt-pointed, scarcely biplicate, margins usually recurved at base, entire or sinuate-serrulate above, costa disappearing in the acumen; leaf-cells somewhat clear, stoutly uni-



papillate on under surface, usually smooth on upper alar; cells quadrate, in 5 or 6 rows; median oval-rhombic to oblong-fusiform,  $7-9\mu$  wide, about twice as long; branch-leaves broadly lanceolate, scarcely secund, 0.25–0.35 mm. wide, 0.5–0.7 mm. long; monoicous: perichetial bracts appressed, plicate, costate, long and narrowly acuminate, entire or serrulate above; pedicel 1.5 cm. long, grooved, twisted to the left below, to the right above, curved, reddish; capsule oblong-cylindric, curved, tapering at base, wrinkled when dry; urn about 2 mm. long, 0.6 mm. wide; exothecial cells oblong-linear, thick-walled; annulus broad, 2–3 rows of cells; teeth lanceolate-linear, 0.6–0.7 mm. long, 0.03 mm. wide, yellowish below, pale above, densely papillose, dividual line faint, ventral surface strongly lamellate; endostomial band yellowish, papillose, about one seventh the length of the teeth; segments as long as teeth, split, scarcely open on the keel; cilia rudimentary; operculum whitish, subshining, narrowly conic, about one half as long as the urn; calyptra cucullate; spores smooth,  $10-13\mu$ , mature in early summer. On the base of trees, rarely on decaying wood, in sandy places. (PLATE 15, FIGS. 1–13.)

TYPE LOCALITY: Delaware; collected by Mr. A. Commons, June 9, 1894; type in the New York Botanical Garden.

DISTRIBUTION: From Maine southward along the coast to Virginia and northward and westward to Minnesota and Dakota. Maine (Merrill); New York (Maxon, Grout); New Jersey (Best); Delaware (Commons); Maryland (Smith, Holzinger); Virginia (Vail and Britton); Ohio (Lesquereux); North Dakota (Holzinger); Minnesota (Holzinger).

EXSICCATAE: S. & L. Musc. Bor. Am. 243 and 365 as *L. obscura*; Ren. & Card. Musc. Am. Sept. 192<sup>b</sup> as *L. polycarpa forma*.

My first acquaintance with *L. arenicola* was in 1892 while collecting in the New Jersey pine-barrens. Recognizing its distinctness as a species specimens of it were distributed under this name. Subsequently, however, while examining the collection of the New York Botanical Garden, the same species was found under the name of *L. Donnellii*, having been collected in Maryland by Mr. J. Donnell Smith and so named by Austin. The type being in a poor condition, with only fragments of peristomes and no opercula, it was thought best to discard Austin's manuscript name and use a new type as well as a new name.

*L. arenicola* is readily distinguished from all other species of *Euleskea* by its curved capsules, longer teeth and segments, longer

and narrower opercula and by its rhombic, elongated leaf-cells. In its general appearance it resembles some forms of *L. polycarpa paludosa*, from which it is however easily separated by the characters just named. When once understood it will probably be found more common than here indicated.

5. LESKEA GRACILESCENS Hedw. Spec. Musc. 222. *pl.* 56, *f.* 8-13. 1801.

*Leskea intermedia* olim mihi.

In intricate spreading tufts, pale to dark green passing to reddish-brown or blackish; stems 2-4 cm. long, creeping, radiculose, pinnately branched; central strand rudimentary or none; branches simple, erect, often subjulaceous: paraphyllia few, lanceolate, rarely none: stem-leaves appressed-imbricated when dry, erect-spreading when moist, 0.4-0.5 mm. wide, 0.65-0.9 mm. long, ovate, gradually acute, obtuse or blunt-pointed, straight, lightly biplicate, margins entire, often more or less revolute, costa subpercurrent; branch-leaves similar, not plicate; leaf-cells somewhat uniform, unipapillate on lower surface, usually smooth on upper; median quadrate-hexagonal, 8-10  $\mu$  broad; alar and basal quadrate; apical roundish: monoicous: perichetial bracts erect, striate, blunt, inner subvaginant, costate; pedicel 8-10 mm. long; capsule erect, oblong-cylindric, tapering at base, substrate and reddish when empty; urn 1.5-2 mm. long, 0.6 mm. wide; exothecial cells oblong, a few rows of roundish cells about the mouth; annulus of two rows of cells, deciduous; teeth whitish, lanceolate-linear, divisural line faint, lamellate, 0.35-0.45 mm. long; endostomial band about one quarter the length of the teeth; segments linear, usually shorter than the teeth, carinate, open, sometimes poorly developed and unequal; cilia none; operculum conic, obtuse or acute; calyptra smooth, cucullate; spores smooth, 8-11  $\mu$ , mature in early summer. On the base of trees, rotten wood, stones and the ground.

TYPE LOCALITY: Pennsylvania; duplicate of type in the Academy of Natural Sciences of Philadelphia.\*

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\* M. Cardot, who has made a careful study of Hedwig's types of American Mosses as found in Herb. Boissier, informs me that *L. gracilescens* is not among them. In the Muhlenberg collection, now in possession of the Academy of Natural Sciences of Philadelphia, there are, however, a number of specimens so named, either positively or questionably. It is probable that one of these is a duplicate of the type, but which one can only be conjectured, since there are no indications pointing to this fact. These specimens, as also those of *L. obscura* in the same collection, make it evident that Hedwig, after founding these species, failed to recognize their distinguishing characters, as nearly all of Muhlenberg's later collections are named either "*L. gracilescens*?" or

*L. gracilescens* is quite common and widely distributed, ranging through the Eastern, Middle, Northern and Western States, rare in Canada and in the Southern States and absent west of the Rocky Mountains. It differs from the closely related *L. polycarpa* by its smaller straight leaves which are shorter and comparatively broader, usually gradually acute and blunt-pointed, and by its shorter, often unequal segments. In some of its forms it approaches *L. polycarpa*, in others *L. obscura*, without however fitting either as a variety. In general terms it may be said that all those doubtful forms that plainly do not belong to either of these species should be referred to *L. gracilescens*, which moreover has priority over the last.

6. *LESKEA OBSCURA* Hedw. Spec. Musc. 223. *pl.* 57. *f.* 1-9. 1801.

*Leskea obtusa* Ren. & Card. Bot. Gaz. 17: 296. 1892.

*Leskea?* *Cardoti* Kindb. Rev. Bryol. 22: 83. 1895.

In loose, spreading tufts, rarely in mats, deep green to dark olive green, older parts rusty brown; stems prostrate, 3-5 cm. long, radiculose, sparingly branched; central strand small, distinct: paraphyllia few, lanceolate, or none: branches short, tumid, or elongated and slender: stem-leaves incurved-appressed when dry, patulous when moist, oblong-ovate, 0.4-0.6 mm. wide, 0.8-1.3 mm. long, straight or slightly curved, thickish, concave, subcarinate, asymmetric, margins plane, apex rounded-obtuse or subacute, entire or serrulate, costa disappearing below apex; branch-leaves similar, more symmetric, obtuse, acute or short acuminate; leaf-cells somewhat uniform, pluripapillate on lower surface with small papillae, papillose or nearly smooth on upper; median cells quadrate-hexagonal, 8-10  $\mu$  wide; basal quadrate-oblong; apical smaller and roundish: monoicous: perichetial bracts erect, appressed, inner subvaginant, costate, blunt-pointed; pedicel smooth, reddish, 1-1.5 cm. long; capsule erect, straight, oblong-cylindric, thin-walled, yellowish, wrinkled and slightly contracted below mouth when dry; urn 1.75-2.25 mm. long, 0.8 mm. wide; exothecial cells oblong-rectangular; teeth linear-lanceolate, yellowish, papillose, lamellate, divisural line distinct below, faint above; endostomial band yellowish, about one fifth the length of the teeth; segments linear, densely papillose, more

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"*L. obscura?*" In this connection it is worthy of note that Hedwig did not regard any of the Muhlenberg mosses as *L. polycarpa*, with which, it is to be presumed, he was familiar.

or less open, shorter than the teeth; annulus of two rows of cells; operculum short-conic, obtuse or apiculate; spores smooth, 11–14  $\mu$ , mature in early summer. On the base of trees or rotten wood; more rarely on stones or the ground in wet places. (PLATE 15, FIGS. 14–27.)

TYPE LOCALITY: Pennsylvania; type in Herb. Boissier.

EXSICCATAE: Drumm. Musc. Amer. 105; Austin, Musc. Appalach. 270; Ren. & Card. Musc. Am. Sept. 193.

ILLUSTRATIONS: Cardot, Bull. Herb. Boissier, 7: pl. 9. f. 4. Sulliv. Icon. Musc. pl. 77 is probably a form of *L. gracilescens*, as the margins of the stem-leaves are recurved. Dr. Robinson is unable to find the specimen in the Sullivant collection from which these drawings were made.

*L. obscura* has about the same range as the preceding, except that it is more frequent southward. Not rarely it grows mixed with *Anomodon attenuatus* and *A. obtusifolius*, to both of which it bears a superficial resemblance. In drying the leaves commonly take on an ashen or plumbeous tint and the lower surface a finely granular appearance. In its typical form *L. obscura* differs from *L. polycarpa* and *L. gracilescens* by its thicker, asymmetric, rounded-obtuse leaves, not plicate and with plane margins; the segments moreover are stouter, more densely papillose and usually more open. Some difficulty may be experienced in discriminating between this species and certain forms of *L. polycarpa paludosa*. The leaves, however, of the latter are usually longer, more or less secund and acuminate, obliquely and sometimes obtusely pointed, the leaf-cells unipapillate and the reddish-brown capsule longer, as also the segments. The most valuable character in differentiating *L. obscura* from the preceding species is the thicker texture of the leaves, the cells of which are covered with minute papillae, resembling those of *Anomodon attenuatus*, but not so many, nor so distinct.\*

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\* We are indebted to M. Cardot for having first called our attention to the distinguishing characters, at least in part, of *L. obscura*. In his valuable "Revision des types d'Hedwig et de Schwaegrichen" (Bull. Herb. Boissier, 7: 348) we are told that there are two series of specimens on the sheet of the type of this species, named respectively "*a. arborea*" and "*b. terrestris*"; that the latter is the one to which Hedwig's description applies and that the former is *L. polycarpa*. On pl. 9, f. 4 of this "Revision" (l. c.) are drawings of two leaves taken from the "*arborea*" series. As far as it is possible to determine, these are identical with the leaves of *L. gracilescens*

7. *LESKEA MICROCARPA* W. P. Schimper, in Sulliv. Musci and Hepaticae of the U. S. 59. 1856.

Plants smallest of the genus, in thin spreading tufts, yellowish green to dark green; stems 1–3 cm. long, creeping, radiculose, subpinnately branched; central strand minute or none: paraphyllia few, small, lanceolate: stem-leaves somewhat rigid, appressed when dry, spreading when moist, 0.3–0.4 mm. wide, 0.4–0.55 mm. long, ovate, subcordate, more or less narrowly long-acuminate, entire, basal margins revolute, costa subpercurrent, rough below; branch-leaves erect-spreading, acute to narrowly acuminate, 0.2–0.25 mm. wide, 0.3–0.35 mm. long, sometimes smaller; leaf-cells small, angular, papillose on lower surface, usually smooth on upper; median cells quadrate-hexagonal, irregular, often indistinct, 5–7  $\mu$  wide: alar oval-quadrate in about 6 rows: monoicous: perichetial bracts somewhat loose, erect or spreading at tips, long and narrowly acuminate, costate; pedicel smooth, erect, 5–7 mm. high; capsule erect, oval-oblong, reddish-brown, shining; urn about 1.5 mm. long and 0.6 mm. wide; exothecial cells large, irregular, rather thick-walled, roundish ovate-oblong, about 4 rows of smaller, oval, reddish cells about the mouth; teeth fragile, whitish, papillose, linear-lanceolate, 0.25 mm. long, confluent at the somewhat broadened base, not markedly bulging when dry, dorsal line faint or none; endostomial band thin, whitish, about 0.07 mm. broad; segments short, often rudimentary; annulus narrow, one to two rows of cells; operculum conic, short-beaked; spores slightly roughened, 9–13  $\mu$  wide, mature in spring. On roots of trees, rotten wood, rarely on the ground. (PLATE 15, FIGS. 28–40.)

TYPE LOCALITY: probably Alabama.

DISTRIBUTION: Florida (Langlois, Rapp); Alabama (Mohr, Earle & Baker); Louisiana (Langlois); Texas (Boll, Thomson, Wright). A specimen in the Gray Herbarium, Harvard University, from Natchez, but without name of collector.

EXSICCATAE: Drumm. Musc. Amer. (S. States) 89 as *L. nervosa*; Sullivant, Musc. Allegh. 67 as *L. polycarpa*; Sullivant, Musc. Allegh. 69 as *L. nervosa*; Ren. & Card. Musc. Amer. Sept. 194 as *L. gracilescens*; Langlois, Fl. Ludov. 246.

as found in the Muhlenberg collection. It would therefore appear quite probable that the moss to which Hedwig gave this name is the same that M. Cardot has referred to *L. polycarpa*. But Renaud & Cardot in their *Musci Americae Septentrionalis Exsiccati no. 194*, for reasons best known to themselves, have applied this name to a moss that belongs exclusively to the southern states, *L. microcarpa* Sch., which in all probability Hedwig never saw and which is quite different from his *L. gracilescens*.

The characters of *L. microcarpa* are fairly constant, except the acumination of the leaves, which varies considerably. In Musc. Allegh. no. 69, taken as the type, the leaves are rather long and narrowly acuminate, in this respect resembling *L. nervosa*; but in the ordinary forms of the species they are shorter acuminate, not rarely gradually acute, sometimes even blunt-pointed or obtuse. *L. microcarpa* differs from *L. nervosa* in being monoicous, leaves papillose, costa rough on lower surface and exothecial cells roundish oblong. Its distinguishing characters are its small angular leaf-cells and its rough costa.

8. LESKEA NERVOSA (Schwägr.) Myrin, Coroll. Fl. Upsal. 52.

1834. Bry. Eur. fasc. 44 and 45 Mon. 4. pl. 3. 1850.

*Pterogonium nervosum* Schwägr. Suppl. 1: 102. 1811.

*Anomodon rigidulus* Kindb. Laubm. Schwed. u. Norw. 11. 1883.

*Anomodon subrigidulus* Kindb. Eur. and N. Am. Bry. 11. 1896.\*

In thin appressed tufts, pale green to dark green, older parts rusty brown or black; stems creeping, 4–7 cm. long, radiculose, not paraphyllose, pinnately branched; branches simple, ascending, sometimes branched; central strand small, distinct: stem-leaves broadly ovate, subcordate, slightly decurrent, abruptly long-acuminate, 0.35–0.5 mm. wide, 0.8–1.3 mm. long; acumen narrowly lanceolate-linear, more or less recurved, margins plane, subsinuate; body concave (subcochleariform), biplicate, margins sometimes recurved on one or both sides; costa subpercurrent, narrow, scarcely tapering; branch-leaves narrow, rigid, erect-spreading, 0.2–0.3 mm. wide, 0.6–0.9 mm. long; leaf-cells smooth or scarcely papillose, somewhat uniform; median cells oval-hexagonal to oval-oblong,  $7-9\mu \times 8-12\mu$ ; alar quadrate to transversely oval in 5 or 6 rows, extending well up the margins and becoming roundish: dioicous: perichetial bracts long and narrowly acuminate, inner erect, subvaginant, slightly costate; pedicel smooth, 10–12 mm. long; capsule erect, subcylindric, brownish, wrinkled when dry; urn 2.2 mm. long, 0.7 mm. wide; exothecial cells oblong, several rows about mouth roundish hexagonal, thick-walled; teeth erect, confluent at base, linear-lanceolate, yellowish, margined, dorsal surface finely striate, divisural

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\* For a more extended synonymy of this species as well as the others of this Revision the reader is referred to Limpricht's "Die Laubmoose" and Braithwaite's "British Moss-Flora."

line zigzag, ventral surface lamellate; endostomial band adherent to the columella, narrow, about one fourth the length of the teeth; segments irregular, unequal, sometimes rudimentary; annulus of two rows of cells, deciduous in pieces; operculum conic, obliquely short-beaked; calyptra cucullate, reaching the base of capsule; spores roughened, 12–15  $\mu$ , mature in summer. About the base of trees, rarely on rotten wood or stones. (PLATE 16, FIGS. 41–54.)

TYPE LOCALITY: Germany.

DISTRIBUTION: From Labrador to British Columbia, southward to Pennsylvania (Burnett) and Colorado (Holzinger). Usually sterile in the United States; fruiting in Smuggler's Notch, Vermont (Mrs. Britton); frequently fertile in British America (Macoun).

EXSICCATAE: Austin, Musc. Appalach. 271; Macoun, Canad. Musc. 252.

As with all widely distributed species, *L. nervosa* is somewhat variable. Depauperate growths with flagelliform branchlets and rudimentary leaves are common. Small heads or spikes of bulbils (gemmae), usually borne on the distal ends of stems and branches, are present in most specimens whether fruiting or not. *L. bulbifera* Brid. is a sterile form with bulbils. In the absence of other distinguishing characters, Bridel's species seems scarcely worthy of varietal rank, much less specific. Brownish septate brood-bodies (propagula) are occasionally found on the leaves of this species.

9. ***Leskea nervosa nigrescens*** (Kindb.).

*Leskea nigrescens* Kindb. Bull. Torrey Club, 16: 97. 1889.

*Leskea nervosa* var. *flagellifera* Kindb. Ottawa Nat. 4: 62. 1890.

*Anomodon heteroideus* Kindb.; Macoun, Cat. Can. P. 6: 62.

1890; Eur. & N. Am. Bry. 12. 1896.

In intricate tufts or mats, dirty yellowish green to dark green or black; stems 2–3 cm. long, creeping, scarcely radiculose, defoliate or with distant ovate narrowly acuminate recurved leaves, irregularly branched; branches usually few, short, ascending with numerous flagelliform branchlets, commonly bearing bulbils at their tips: branch-leaves as in type but smaller, 0.2–0.3 mm. wide, 0.4–0.6 mm. long; leaf-cells quadrate-hexagonal, smooth or slightly papillose, 6–8  $\mu$  wide; leaves of branchlets rudimentary, scarcely costate: sterile. On the base of trees, sometimes on stones and rocks; with the type but less common; Canad. Musc.

In nearly all specimens of this variety leaves from either stems or branches may be found sufficiently developed to show that they are identical with those of *L. nervosa*, proving conclusively that var. *nigrescens* is only a retrograde form of this species. Moreover tufts are often made up of both plants growing together, the one bearing bulbils in small heads, the other a few on flagellate branchlets. While these organs are usually sessile when in compact clusters, they sometimes appear on short flagellate stems, thus constituting a transitional form between those of the type and those of var. *nigrescens*. Such was conspicuously the case with a specimen from Vermont (Dr. Grout).

10. *LESKEA DENTICULATA* Sullivan, Musci Alleghen. No. 62. 1845; Mosses of the U. S. 59. 1856.

*Hypnum fabroniaefolium* C. Müll. Syn. 2: 271. 1851.

Plants small, in depressed tufts, pale green, soft, somewhat silky; stems prostrate, 2–4 cm. long, sparingly radiculose, irregularly branched, without central strand or paraphyllia; stems and branches flattened when moist, sometimes subjulaceous when dry: stem-leaves close, erect-spreading, concave, subdecurrent, ovate, somewhat abruptly and narrowly acuminate, 0.5–0.7 mm. long, 0.3–0.4 mm. wide, ecostate, rarely with diverging striae; margins plane, minutely papillose-denticulate; branch-leaves smaller, more gradually acuminate, 0.3–0.4 mm. long, 0.2–0.3 mm. wide; leaf-cells somewhat uniform, primordial utricle usually distinct, unipapillate on lower surface; median cells oval-oblong to sublinear-rhomboidal, 6–8  $\mu$  wide, two to four times as long, rarely longer and subvermicular; alar quadrate, thick-walled, passing abruptly to the median; marginal curvilinear, in a single row; cells of branch-leaves shorter, oval-rhombic to oblong: dioicous: pedicel smooth, 4–8 mm. long; capsule oval-oblong, suberect; teeth linear-lanceolate, long-pointed; endostomial band?; segments nearly as long and as broad as teeth, carinate, cleft between the joints; cilia none; annulus none; operculum rostellate from a broad highly convex or conical base; calyptra cucullate; spores?, mature? On base of trees, rarely on rocks; seldom fruiting; sometimes flagelliferous.

TYPE LOCALITY: Balsam Mt., N. C.; type in the Gray Herbarium, Harvard University.

DISTRIBUTION: From New York (Austin) westward to Indiana (Haines) and southward to Florida (J. D. Smith); New Jersey (Austin); Pennsylvania (Burnett); Ohio (Biddlecome);



Virginia (Vail and Britton); North Carolina (Sullivant); Georgia (Harper); Alabama (Mohr); Louisiana (Langlois).

EXSICCATAE: Drumm. Musc. Am. (S. States) 86 as *Pterogonium filiforme*, var.?; Austin, Musc. Appalach. 267; S. & L. Musc. Bor.-Amer., ed. 1, 245; ed. 2, 347; Ren. & Card., Musc. Amer. Sept. 85.

ILLUSTRATION: Sulliv. Icon. Musc. pl. 78.

As good fruiting material of *L. denticulata* was not at hand, the somewhat imperfect description of the sporophyte was taken from Sullivant's *Icones Muscorum*. The generic position of this species is open to question, as indicated by Sullivant in Mosses of the United States. The leaves in shape and areolation resemble those of the *Fabroniae*. The papillae on their dorsal surfaces appear to have escaped Sullivant's notice. It is quite probable that when better understood *L. denticulata* will be assigned to some other genus.

#### 11. *Leskea Williamsi* sp. nov.

Plants quite small, in spreading subshining tufts, pale yellow to golden brown; stems slender, creeping, radiculose, pinnately branched, 2-4 cm. long; central strand none; branches ascending, simple or with flagellate branchlets: lower stem-leaves decolorate, roundish ovate, abruptly acuminate, costa short, nearly obsolete; upper stem-leaves appressed when dry, erect-spreading when moist, straight or subsecund, entire or serrulate above, ovate-lanceolate, acuminate, acumen about as long as the concave biplicate body, 0.25-0.35 mm. wide, 0.4-0.5 mm. long; margins recurved below or plane all around; costa short, thin, simple or bifid, scarcely reaching the middle; branch-leaves smaller, 0.15-0.20 mm. wide, 0.25-0.4 mm. long; leaf-cells smooth, clear; median linear-rhomboidal to fusiform, subvermicular, about  $6\mu$  wide, 3-5 times as long; alar quadrate to transversely oval, in about 4 rows, extending well up the margins and passing to oval-oblong: dioicous: perichetial bracts oblong-lanceolate, acuminate, striate-plicate, inner subvaginant; pedicel smooth, flexuous, about 1 cm. long; capsule straight, erect or inclined, oblong-subcylindric, tapering at base; urn 2 mm. long, 0.7 mm. wide, brownish; teeth reddish, incurved when dry, lanceolate, confluent at base, finely striate below, rugulose above, divisural line distinct, ventral surface lamellose; endostomial band strongly reticulated, about one fourth the length of the teeth; segments narrow, concave-keeled, hiant, about as long as teeth; cilia none; annulus of

two rows of pellucid cells, shed with the operculum; operculum conic, straight or obliquely beaked; calyptra cucullate, reaching to the base of the capsule; spores smooth,  $10-13\mu$  wide, mature in summer. On rocks and rotten wood. (PLATE 16, FIGS. 55-68.)

TYPE LOCALITY: Montana; type collected by Mr. R. S. Williams, on Tenderfoot or Belt Mountains, Sept. 9, 1891; now in the Herbarium of the New York Botanical Garden; also collected by Mr. Williams at Columbia Falls, Mont., and by Prof. Holzinger in Minnesota.

In general appearance *L. Williamsi* resembles the smaller forms of *L. tectorum*, from which it differs, however, by its narrower, longer acuminate, often serrate leaves, its longer median cells, its broader, strongly reticulated endostome and its striate-plicate perichetial bracts. Named in honor of my friend Mr. R. S. Williams.

12. *Leskea Williamsi filamentosa* var. nov.

In thin loosely spreading or somewhat intricate tufts, pale green passing to yellowish green or reddish brown; stems prostrate, defoliate or with a few rudimentary leaves, sparingly branched; branches filiform, diffusely spreading, 2-5 cm. long; branchlets flagellate, brittle, broken when dry: larger branch-leaves narrowly ovate-lanceolate, long-acuminate, erect, not plicate, entire or serrulate above, 0.15-0.2 mm. wide, 0.3-0.5 mm. long; costa thin, commonly marked by 3 or 4 rows of enlarged cells, disappearing below the middle; leaf-cells smooth, clear, not uniform; median cells oval-rhombic to linear-rhomboidal, 2-4 times as long as wide; alar quadrate, in 3 or 4 rows; leaves of branchlets similar, smaller, sometimes rudimentary: sterile.

Type of variety collected by Mr. L. F. Anderson on rocks near Lahoon, Idaho. Drummond's *Musci Americana* 219, in part; Brandegee's *Mosses of Southern Colorado* 38.

This delicate little moss appears to have been a standing puzzle for several years. It was found in some of the sets of Drummond's *Musci Americana* no. 219, but not in all, and was distributed as *Hypnum catenulatum*. Some of the other sets of this number, but not all, contained *Heterocladium heteropteroides filicens*, a moss it closely resembles, but which differs in being papillose. Some years ago Mr. Gepp sent me from the Natural History Museum in London a portion of one set of Drummond's 219 bearing the name of *Hypnum graveolens* Wils. It therefore

appears that so good an authority as Wilson had discovered that the moss in question was not *Leskea catenulata* (Brid.). Subsequently Mrs. Britton gave me some specimens of Brandegee's no. 38 which I named *Heterocladium heteropterum fallax* Milde?. A careful study of Drummond's 219 and Brandegee's 38 made it obvious that we had to deal with an attenuated form of some species which under more favorable conditions grew better developed.

13. *LESKEA TECTORUM* (A. Braun) Lindb. Bot. Notis. **1865**: 73. 1865.

*Pterogonium tectorum* A. Braun; Brid. Bryol. Univ. **2**: 582. 1827.

*Leskea Wollei* Austin, Bull. Torrey Club, **5**: 28. 1874.

*Pseudoleskea malacoclada* C. M. & K.; Macoun, Cat. Can. Pl. **6**. 182. 1892.

Plants small, in rather dense subshining tufts or mats, deep green passing to reddish brown or black; stems prostrate, 2–5 cm. long, radiculose, pinnately branched; branches ascending, short, simple, sometimes with flagellate branchlets, sharply pointed when dry; central strand small, distinct: paraphyllia few, lanceolate, sometimes none: lower stem-leaves broadly ovate, abruptly and narrowly acuminate, acumen spreading or recurved; upper stem-leaves subdecurent, ovate, abruptly acuminate, acumen shorter than the concave scarcely plicate body; margins entire, plane or recurved on one or both sides below; branch-leaves ovate, abruptly or gradually acuminate, margins plane, entire, costa short, simple, sometimes forking, rarely none; leaf-cells somewhat uniform, smooth, clear, thin-walled; median cells oval-oblong to oblong-rhomboidal, rounded at both ends, 9–12  $\mu$  wide, 1½–3 times as long; alar transversely compressed in 5–7 rows; upper rhombic-oval or roundish: dioicous: [perichetial bracts erect, long-acuminate, the inner shorter, blunt-pointed and coarsely serrate at point: pedicel purple, 1.5 cm. long, curved at base; capsule cylindric, somewhat curved, reddish brown; urn 2.7 mm. long, 0.75 mm. wide; exothecial cells rectangular, somewhat elongated; annulus of two rows of cubical cells, separating from the operculum; teeth lanceolate, yellowish, thinly margined, divisural line straight, inner surface lamellose; endostomial band yellowish, one sixth the length of the teeth; segments about as long as the teeth, narrow, constricted at the joints, keeled, not hiant; cilia none or rudimentary; spores 10–14  $\mu$ , brownish, smooth, maturing in August.]\* (PLATE 16, FIGS. 69–76.)

\* Abstracted from Limpricht's *Die Laubmoose*, **2**: 271; described from fruiting specimens collected by E. Ryan in Norway, the only fruiting locality known.

On rocks, rotten wood and bases of trees. (In Europe commonly found on roofs, slate, tile or wood.)

TYPE LOCALITY: Germany.

DISTRIBUTION: From Lake Superior (Wolle, Macoun) westward to British Columbia (Macoun) and northward to the Yukon (Williams); Colorado (Blake & Holzinger); Minnesota (Holzinger).

ILLUSTRATION: Husnot, *Musc. Gal. pl. 86*.

Widely distributed and quite variable, *L. tectorum* is usually easily recognized when once understood. Its leaf-cells, broad, plump, rounded, glassy, furnish its most distinctive character. Its leaves are quite like those of *Amblystegium adnatum* but somewhat smaller. This differs, however, in having its leaf-cells longer and narrower, especially in the upper part of the leaves, so that no difficulty need be experienced in discriminating between the two species. The closely allied European *Leskea catenulata* (Schwägr.) Brid., undoubted specimens of which have not as yet been reported from North America, may be known by its narrower, longer and thicker costa, usually reaching the middle and not forking, and by its thick-walled leaf-cells.

The type of *L. Wollei* Aust. has been compared with European specimens of *L. tectorum*, with the result of finding them nearly or quite identical. While the median leaf-cells are slightly longer, sometimes more rhomboidal than in the ordinary forms of this species, the same variations occur in foreign specimens. The cotype of *Pseudoleskea malacoclada* C. M. & K., through the kindness of Prof. Macoun, has likewise been seen and carefully examined. Although it is slightly stouter and the basal margins of the leaves are more commonly recurved, it differs in none of the essentials from the specific type of *L. tectorum*.

14. *Leskea tectorum flagellifera* var. nov.

In somewhat dense compact tufts, pale green to yellowish-brown; stems prostrate, pinnately branched; branches filiform with numerous flagellate deciduous branchlets; stems defoliate, rarely with rudimentary leaves; branch-leaves as in type but usually much smaller; leaf-cells smooth, clear, oval-rhombic; leaves of branchlets very small, 0.05–0.1 mm. wide, 0.1–0.2 mm. long. Differs from *L. Williamsi filamentosa* by its entire leaves and larger leaf-cells. Type of variety collected by Mr. R. S. Williams

at Columbia Falls, Montana, Sept. 5, 1895; found also by Professor Holzinger in Minnesota. It usually grows on rocks and rotten wood.

The North American *Heteroleskeae* differ from the European by being usually more markedly proliferous. The somewhat dense tufts of var. *flagellifera* are mostly flagellate branchlets which when dry readily separate from their attachments. By soaking these tufts and dissecting out the stems and branches leaves may usually be found sufficiently developed to make possible the identification of the plants.

15. *LESKEA CYRTOPHYLLA* Kindb. in Macoun, Cat. Can. Pl. 6: 169. 1892.

Plants very small, in rather compact tufts, deep green to rusty brown; stems 1–2 cm. long, prostrate, scarcely radiculose, irregularly branched; branches erect, simple or with flagellate branchlets: paraphyllia usually none: stem-leaves somewhat spreading, roundish ovate, concave, broadly inserted, 0.3–0.4 mm. wide, 0.4–0.5 mm. long, abruptly acuminate, acumen usually sharp-pointed; costa short, thin, usually forking; margins entire, sometimes recurved below; branch-leaves roundish-ovate, rather gradually acute or short-acuminate, often blunt-pointed, 0.2–0.25 mm. wide, 0.25–0.3 mm. long; leaf-cells rounded or angular, not uniform, somewhat clear, with usually a small flat subcentral papilla on each surface; median cells oval-rhombic, 9–13  $\mu$  wide, 12–16  $\mu$  long; alar transversely compressed, in 5–7 rows: apparently dioicous: capsules not seen. On rocks and stones.

TYPE LOCALITY: Canada; type collected by Prof. John Macoun, July 10, 1884, on rocks on islands in Lake Nepigon; now in the museum of the Geological Survey of Canada.

*Leskea cyrtophylla* is closely related to *L. tectorum*, differing from this species more especially by being somewhat papillose. It may be regarded as a transitional form connecting *L. tectorum* with *Heterocladium papillosum* Lindb. (An authentic specimen of the latter has been seen through the kindness of Professor Holzinger and Mr. Harald Lindberg.) The type of *L. cyrtophylla* is flagellate and depauperate. Much better material of apparently the same has been collected in Colorado and Minnesota by Professor Holzinger.

ROSEMONT, N. J.

**Explanation of Plates**

## PLATE 15

*Leskea arenicola*

1. Plant, natural size.
- 2, 3. Outlines of stem-leaves.  $\times 44$ .
- 4, 5. Outlines of branch-leaves.  $\times 44$ .
6. Apex of stem-leaf.  $\times 170$ .
7. Median cells of leaf.  $\times 350$ .
8. Cross-section of stem.  $\times 235$ .
9. Perichetial bud.  $\times 7\frac{1}{2}$ .
10. Inner perichetial bract.  $\times 18$ .
11. Capsule.  $\times 9$ .
12. Peristome (annulus of three rows).  $\times 100$ .
13. Spores.  $\times 100$ .

*Leskea obscura*

14. Plant, natural size.
- 15, 16. Outlines of stem-leaves.  $\times 44$ .
17. Outlines of branch-leaves.  $\times 44$ .
18. Apex of stem-leaf.  $\times 170$ .
19. Median cells from leaf.  $\times 390$ .
20. Cross-section of stem.  $\times 235$ .
- 21, 22. Perichetial buds.  $\times 7\frac{1}{2}$ .
23. Inner perichetial bract.  $\times 18$ .
24. Capsule.  $\times 9$ .
25. Peristome (annulus for the most part of two rows).  $\times 100$ .
26. Spores.  $\times 100$ .
27. Longitudinal section through peristome.  $\times 130$ .

*Leskea microcarpa*

28. Plant, natural size.
29. Outline of stem-leaf.  $\times 44$ .
- 30, 31, 32. Outlines of branch-leaves.  $\times 44$ .
33. Apex of stem-leaf.  $\times 170$ .
34. Median cells of leaf.  $\times 390$ .
35. Cross-section of stem.  $\times 235$ .
36. Perichetial bud.  $\times 7\frac{1}{2}$ .
37. Inner perichetial bract.  $\times 18$ .
38. Capsule.  $\times 9$ .
39. Peristome (annulus for the most part of one row).  $\times 100$ .
40. Spores.  $\times 100$ .

## PLATE 16

*Leskea nervosa*

41. Plant, natural size.
- 42, 43. Outlines of stem-leaves.  $\times 44$ .
- 44, 45. Outlines of branch-leaves.  $\times 44$ .

- 46. Apex of stem-leaf.  $\times 130$ .
- 47. Median cells of leaf.  $\times 310$ .
- 48. Cross-section of leaf.  $\times 130$ .
- 49. Cross-section of stem.  $\times 130$ .
- 50. Perichetial bud.  $\times 7\frac{1}{2}$ .
- 51. Perichetial leaf.  $\times 20$ .
- 52. Capsule.  $\times 15\frac{1}{2}$ .
- 53. Peristome.  $\times 130$ .
- 54. Spores.  $\times 130$ .

*Leskea Williamsi*

- 55. Plant, natural size.
- 56, 57. Outlines of stem-leaves.  $\times 44$ .
- 58, 59, 60. Outlines of branch-leaves.  $\times 44$ .
- 61. Apex of stem-leaf.  $\times 130$ .
- 62. Median cells of leaf.  $\times 310$ .
- 63. Cross-section of stem.  $\times 130$ .
- 64. Perichetial bud.  $\times 7\frac{1}{2}$ .
- 65. Perichetial leaf.  $\times 20$ .
- 66. Capsule.  $\times 15\frac{1}{2}$ .
- 67. Peristome.  $\times 130$ .
- 68. Spores.  $\times 130$ .

*Leskea tectorum*

- 69. Plant, natural size.
- 70. Outline of a portion of stem.  $\times 20$ .
- 71. Outline of stem-leaf.  $\times 44$ .
- 72. Outline of branch-leaf.  $\times 44$ .
- 73. Apex of stem-leaf.  $\times 130$ .
- 74. Median cells of leaf.  $\times 310$ .
- 75. Cross-section of leaf.  $\times 130$ .
- 76. Cross-section of stem.  $\times 130$ .